

REMARKS

The Present Invention

The present invention is directed to a testing device for detecting and localizing material inhomogeneities in electrically conductive samples. The device comprises a holder for the samples to be tested, a temperature setting device for forming a temperature profile in the sample, and at least one measuring sensor for the contactless measurement of the magnetic field outside of the sample. Several measuring sensors are provided at different distances to the sample.

The present invention is also directed to a method of detecting and localizing material inhomogeneities in electrically conductive samples. The method comprises bringing the sample to a predetermined temperature profile and contactlessly measuring the magnetic field outside of the sample using several measuring sensors provided at different distances to the sample.

The Pending Claims

Claims 15-32 are currently pending. Claims 15-22 are directed to the testing device, whereas claims 23-32 are directed to the method.

The Amendments to the Specification and Drawings

The second full paragraph on page 3 of the specification has been deleted to remove reference to the claims. Figure 1 has been amended to label box 40 as "electronic device" as supported by the specification at, for example, page 6, second full paragraph. No new matter has been added by way of these amendments.

The Office Action

Claims 12-14 remain rejected under 35 U.S.C. § 112, second paragraph. Objections have been raised with respect to the specification, the claims and the drawings. Claims 15-24, 31 and 32 have been rejected under 35 U.S.C. § 103(a) as obvious in view of and, therefore, unpatentable over Evanson et al. in view of Moulder et al. The Office has objected to claims 25-30 as dependent upon a base claim rejected under Section 103(a). Reconsideration is hereby requested.

Discussion of Rejection under 35 U.S.C. § 112, second paragraph

According to the Office, claims 12-14 remain in the application and depend from canceled claims. Consequently, claims 12-14 remain rejected under Section 112, second paragraph. This rejection is traversed for the reasons set forth below.

The Office renumbered claims 12-29 as claims 15-32 in the Office Action dated September 24, 2002 (see page 2, section 1., second full paragraph). Consequently, independent claim 12 is now independent claim 15 and does not depend from any claim, let alone a canceled claim. In response to the Office Action dated September 24, 2002, Applicants renumbered the dependencies of the renumbered claims accordingly. Hence, claims 16 (formerly claim 13) and 17 (formerly claim 14) depend from claim 15 (formerly claim 12). Therefore, claims 16 and 17 also do not depend from canceled claims.

In view of the foregoing, Applicants respectfully submit that the rejection under Section 112, second paragraph, is improper. Accordingly, Applicants request the withdrawal of this rejection.

Discussion of Objection to Specification and Drawings

The Office has objected to the specification for referring to the claims. The Office did not, however, provide page and line numbers where reference to claim(s) is made. Applicants' review of the specification resulted in the identification of a single reference to the claims at page 3, second full paragraph. This paragraph has been deleted. In view of the amendment to the specification, the objection to the specification is believed to be moot.

The Office also has objected to the drawings. According to the Office, box 40 in Fig. 1 is not labeled. Yet "40" is the label given to the indicated box in Fig. 1. Box "40" in Fig. 1 is described in the instant specification at page 6, second full paragraph, as an electronic device. In the event that the Office wants the box to be labeled "electronic device," Applicants have included a marked up Fig. 1 showing the proposed amendment to the drawing for consideration and a replacement sheet, in the event the proposed amendment is approved.

Discussion of Rejection under 35 U.S.C. § 103(a)

The Office has rejected claims 15-24, 31 and 32 under Section 103(a) as obvious in view of and, therefore, unpatentable over Evanson et al. in view of Moulder et al. The Office has objected to claims 25-30 as dependent upon a rejected base claim, and has indicated that claims 25-30 would be allowable if rewritten in independent form, including all of the

limitations of the base claim and any intervening claims. This rejection and this objection are traversed for the reasons set forth below.

According to the Office, Evanson et al. discloses all of the claimed subject matter, except for rotating the sample and setting the temperature of the sample. Moulder et al. is said to disclose the setting of the temperature of the sample. According to the Office, it would have been obvious to set the temperature of the sample in the device of Evanson et al. in view of the alleged teaching of Moulder et al. The Office considers rotating the sample to be an obvious design choice.

The present invention uses a spatial variation of the temperature distribution within the specimen. This temperature profile generates electrical currents at metallic material inhomogeneities within a surrounding of other metal. This is due to a thermoelectric effect referred to as the Seebeck effect. The electrical currents, in turn, generate magnetic fields, which leak out of the specimen. The magnetic fields are detected with a magnetic sensor. The magnetic sensor does not generate magnetic fields; rather, the magnetic fields are generated completely within the specimen.

Evanson et al. uses a magnetizing curve, i.e., $B(H)$ curve of the specimen, and deduces material properties from its shape. In order to do this, an external magnetic field is generated in the measurement system. The magnetic field has a strong "dc" component and a weak, low frequency "ac" component. The response of the material, which leads to the $B(H)$ curve, depends on the magnetizing properties of the specimen.

In contrast, Moulder et al. uses an eddy current method. An eddy current probe generates an "ac" magnetic field of medium frequency and detects the magnetic field, especially its changes, caused by defects within the specimen. The primarily exciting magnetic field is generated within the measuring system -- not within the specimen. Moulder et al. further uses a time variation of the temperature distribution within the specimen. This results in a variation of the local electrical conductivity within the specimen. This, in turn, changes the eddy current signal. When flaws, cracks, voids or holes are present, the temperature distribution is different from the situation without these regions of zero thermal and electrical conductivity. Signatures in the eddy current signal give hints to such defects. The temperature distribution may or may not spatially vary -- it may be homogeneous or heterogeneous.

Thus, in distinct contrast to the present invention, Evanson et al. and Moulder et al. employ an external exciting magnetic field. Furthermore, the magnetizing properties of the specimen of Evanson et al. are quite different in physical nature from the eddy current properties of the specimen of Moulder et al. Consequently, it would not have been obvious to

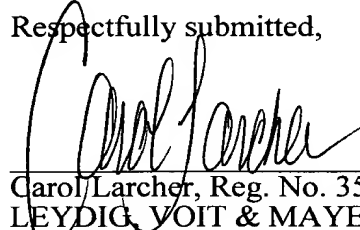
set the temperature of the sample as disclosed by Moulder et al. in the method of Evanson et al. Furthermore, there would be no technical advantage in doing so. The basic physical effects of Evanson et al. and Moulder et al. do not require a temperature setting. Even if, for the sake of argument, one were to modify the method of Evanson et al. by setting the temperature of the sample in accordance with Moulder et al., one simply would not arrive at the present invention, which does not employ an external exciting magnetic field at all and which requires setting a temperature so as to generate a temperature profile.

In view of the foregoing, claims 15-24, 31 and 32 cannot be said to be obvious in view of and, therefore, unpatentable over Evanson et al. in view of Moulder et al. Accordingly, an objection cannot be raised with respect to claims 25-30 as depending from a rejected base claim. Therefore, Applicants request the withdrawal of the rejection and the corresponding objection.

Conclusion

In view of the above remarks, the application is considered to be in good and proper form for allowance, and the Office is respectfully requested to pass this application to issuance. If, in the opinion of the Office, a telephone conference would expedite prosecution, the Office is invited to call the undersigned attorney.

Respectfully submitted,



Carol Larcher, Reg. No. 35,243
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
180 North Stetson
Chicago, Illinois 60601-6780
(312) 616-5600 (telephone)
(312) 616-5700 (facsimile)

Date: September 2, 2003

